Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

AN INTRACELLULAR PROTOZOAN PARASITE OF THE DUCTS OF THE SALIVARY GLANDS OF THE GUINEA-PIG

WITH ONE PLATE

LEILA JACKSON

From the John McCormick Institute for Infectious Diseases, Chicago

In the course of an examination of the various salivary glands of the guinea-pig for an entirely different purpose, a peculiar protozoan infection of the ducts was observed, which seemed of sufficient interest to warrant further study. Accordingly, a microscopic examination was made of the salivary glands of 48 guinea-pigs. Through the kindness of Dr. H. J. Corper, I was able to secure salivary glands from 18 tuberculous guinea-pigs that came originally from Pennsylvania and had been brought here but a few days before they were killed. The kidneys of most of these animals were also examined as they are sometimes the seat of a coccidial infection. The intestines, unfortunately, were examined in only a few cases. The disease apparently causes the animal very little, if any, inconvenience and no gross pathologic changes were distinguished in the glands. On microscopic examination it was found that glands from 26 of the 48 guinea-pigs were infected. The infection occurred in about the same proportion of cases in the guinea-pigs obtained from Dr. Corper and in those from our own laboratory. The ducts of the serous portions of the glands are the favorite location of the parasite, but they are occasionally found in the ducts of the mucous glands, especially if the infection is severe. Many of the guinea-pigs had very mild infections, and the chief change aside from the presence of parasites in the cells of the ducts was a small amount of mononuclear infiltration about affected ducts, and in presumably early cases even this was lacking. In the cases in which the process was advanced, considerable portions of the gland were involved and more or less destruction of ducts and glandular tissue was evident.

The protozoan, as it most often appears in the cells of the ducts of the salivary gland, is an encysted organism of irregular, round or oval contour. In its most conspicuous and fully developed form it

Received for publication Dec. 16, 1919.

practically replaces the host cell which still retains its relations to the duct wall. The center is occupied by a round or oval body of irregular outline which stains deeply and unevenly. Around this central or restiform body is a rather wide, lightly stained zone, and outside of this a peripheral zone or capsule which may vary considerably in width, the widest part being that directed toward the lumen of the duct.

From a study of the parasite it appears that the chromatin condenses at various points on the surface of the central body, and smaller bodies bud off and proceed through the intermediate zone to the periphery where they possibly undergo further division. These smaller, deeply stained bodies of irregular outline and unequal size, are seen in various stages of separation from the central body and in various positions in the intermediate zone, and in some instances the chromatin material forms bands of considerable width extending from the central body to the border of the peripheral zone (Fig. 5). The appearance of radiating lines from the central body to the periphery at a certain stage of development is evidently the result of this budding off process.

Considering the large number of round, lightly stained bodies, which appear in the peripheral zone of the parasite at a certain stage of its development, and the comparatively few more deeply stained, irregularly shaped bodies seen in the process of separation from the central body and in the various stages of progress toward the peripheral zone, it seems not unlikely that further division of the latter bodies takes place when they reach the outer part of the intermediate zone; this, however, cannot be stated with certainty. The peripheral zone, as previously stated, varies considerably in width and stains more deeply than the intermediate zone, and in the later stages of development it contains large numbers of round bodies which collect for the most part in the portion of the capsule nearest the lumen of the duct. I have not been able to satisfy myself as to the exact number of these bodies, if indeed there is a definite number given off by each parasite. As counted in the stained preparations, they vary in number in the apparently fully developed forms from 30-40 or more. A form of the parasite which differs somewhat from that just described is seen only occasionally (Fig. 4). It is about the size of the large forms just described. In the intermediate zone is a band apparently made up of small, elongated bodies which seem to radiate from the central body. This band nearly or entirely encircles the restiform body, and is separated from it and from the peripheral zone by a clear space. No rounded bodies are seen in the peripheral zone. Just what is the significance of this form is not evident.

The earliest form of the parasite observed is a small, round, deeply stained body embedded in the cytoplasm of the epithelial cell of the duct (Fig. 3). As the parasite grows it develops an enveloping membrane or capsule, and later a definite intermediate zone appears between the deeply stained restiform body and the capsule. A form frequently seen is one in which the central body is elongated with the chromatin massed at the two poles.

In infections of long standing one may often find the cast off restiform body in the lumen of the duct and occasionally in the tissue just outside the duct. It appears as a pink stained vacuolated body of irregularly round or oval shape. That the parasite penetrates to the tissues about the ducts in the severed infections seems probable. I have observed what I believe to be young forms in the infiltrated regions about the ducts in which the epithelium has largely been destroyed and occasionally young forms appear in the glandular cells in these cases, but no fully developed types have been observed in these locations. In the severe infections one may find four or five of the organisms in a cross section of a duct, or if the section is lengthwise of the duct, the parasites are arranged side by side, and projecting into the lumen present a sawtooth-like appearance.

It seems evident from the foregoing that we are concerned with the vegetative cycle of an intracellular protozoan, the sexual cycle of which does not occur in this location. Since during this stage of development apparently no organs of locomotion are produced and the parasite becomes encysted, it probably belongs to the class protozoa and from its intracellular position most likely among coccidia. This being the case, we may consider the small round bodies in the peripheral zone of the parasite as merozoits.

Whether the parasite gains entrance to the salivary gland by way of the ducts from the oral cavity or by way of the blood stream is not obvious. If infection takes place by way of the ducts, the progress of the parasite up the duct is against the flow of saliva as the epithelial cells of the distal portions of the ducts are never invaded. Whatever the mode of entrance, it is evident that the larger ducts do not offer favorable conditions for the growth of the parasite.

The parasite stains fairly well by the ordinary staining methods, hematoxylin and eosin, methylene blue and eosin, polychrome methylene blue and eosin and Giemsa.

A routine microscopic examination of the other organs of guinea-pigs was not carried out, except in a few cases in which the results were negative, with the exception of the kidneys. The kidneys of 44 of the 48 guinea-pigs were examined for protozoa, and 12 were found positive. The organisms present were usually few in number and apparently correspond with the forms of Klossiella muris described by Smith and Johnson[1] and Louise Pearce,[2] but appear to have no relation to the parasites in the salivary gland.

---

[1] Jour. Exper. Med., 1901-5, 6, p. 303.

[2] Ibid., 1916, 23, p. 431.

EXPLANATION OF PLATE

Fig. 1.—Area of infiltration in which are infected ducts, × 130.

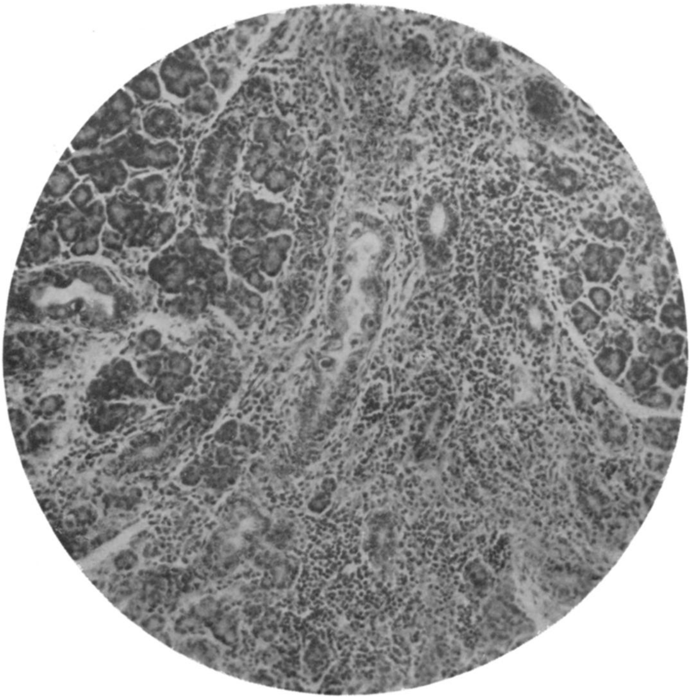
Fig. 2.—A duct containing four large parasites, in three of which merozoits are easily distinguished, × 650.

Fig. 3.—A duct containing two large forms and an early form of the parasite, × 680.

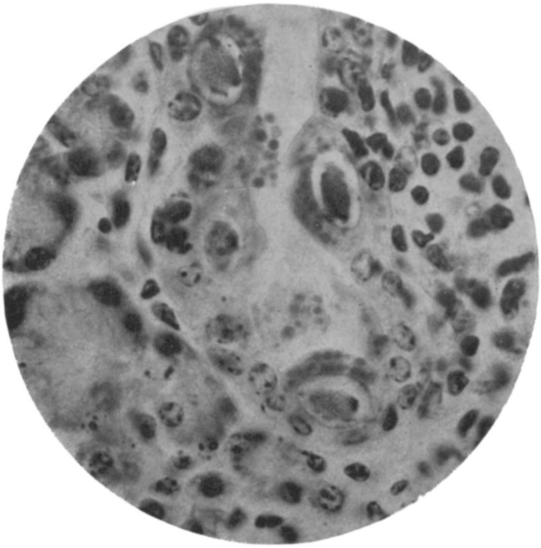
Fig. 4.—A duct containing four parasites, the lower one of which is a form seen only occasionally, × 680.

Fig. 5.—A large form of the parasite showing budding of small bodies from the restiform body, × 680.

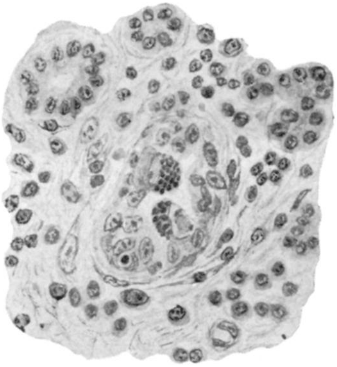
Plate



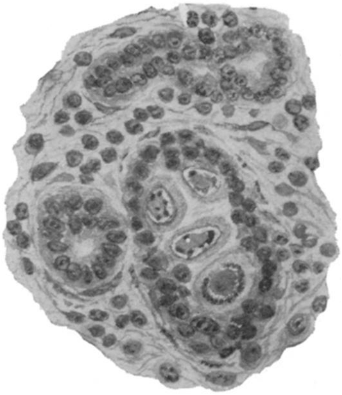
1



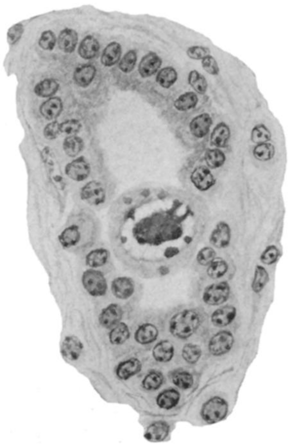
2



3



4



5

Jackson: Intracellular Protozoon Parasite of Ducts of Salivary Glands of Guinea-Pigs